REMARKS

After the foregoing amendment, claims 1-6 and 8-20 are active in the present application. Claim 7 has been cancelled. In addition, claims 1, 6, 10, 13, 15, 16 and 18 have been amended. No new matter has been added by the amendment. Reconsideration and allowance of the application, as amended, are respectfully requested.

Independent claims 1, 15 and 18 have been amended to highlight that the present invention uses only a foil sheet and a single layer of conductive material (e.g., solder) to form a packaged device. Claim 7 has been cancelled and the subject matter thereof added to claim 6. Claims 10 and 16 have been amended to highlight how the package terminals are formed.

Claims 1-20 were under 35 USC 103 as unpatentable over US Patent Application No. 2004/0097081 (Igarashi) in view of U.S. Patent No. 5,568,363 (Kitahara). Igarashi forms the primary basis for the rejection and Kitahara is cited for teaching attaching a die to a bare metal sheet. Applicants respectfully traverse the rejection.

The present invention is directed to a method of packaging an integrated circuit die. A metal foil sheet has a single layer of solder formed on one side thereof. Subsequently, an IC die is attached to the solder layer (see FIG. 2A). Die bond pods then are connected to the solder layer with a wire bonding process. In the wire bonding process, ball bonds are formed on the solder layer (see FIG. 2B). The die and wire bonds are encapsulated and

then the foil sheet is separated from the die and the wires. The package terminals comprise the ball bonds formed during the wire bonding process and a portion of the solder that remains attached to the ball bonds after the foil sheet is separated from the die. As discussed above, independent claims 1, 15 and 18 have been amended to make it clear that a foil sheet with a single layer of solder are used in the present invention.

Igarashi, like the present invention, teaches a method of packaging a semiconductor IC. Although the final package (FIG. 14) looks somewhat similar to the final package (FIG. 2E) of the present invention, the respective packages are actually quite different.

Igarashi forms a laminated plate 10 using first, second and third conductive films 11, 12 and 13. A fourth conductive film 14 also is adhered to the plate 10. An etching process is performed to form pads 14A (Igarashi at [0068]). Additional complex and expensive etching steps are performed to remove portions of the films 11 and 13 (Igarashi at [0072] to [0079]). In contrast, the present invention uses a single foil sheet with a layer of solder.

Igarashi attaches the die to the multi-layer substrate and then wires from bond pads of the IC to the built up pads 14A. After encapsulation, the second conductive film (12) is removed (see FIG. 11). Then, an additional resin layer 23 is coated onto the bottom of the package and finally, electrodes 24 are formed by screen printing a solder cream onto the bottom of the package and performing a reflow.

In contrast, the present invention forms the electrodes (package terminals) simply during the ball

bonding process, in which ball bonds are formed on the solder layer and then a reflow operation is performed. Thus, in the present invention, there is no separate solder ball attach process to form the package terminals.

The Office Action recognizes that the present invention uses a foil sheet with a solder layer thereon as opposed to the complex, multi-layered structure taught by Igarashi, so Kitahara is cited as disclosing the use of a bare metal sheet.

The metal sheet (3) of Kitahara is a typical lead frame. A bumped die is attached to the lead frame. More particularly, bumps (11) are attached to leads (3) and then covered with a sealing resin (2). Kitahara differs from the present invention in that the present invention does not involve a lead frame or metal leads. Note that the leads (3) of Kitahara form an important part of the final package; whereas in the present invention, the foil sheet does not form any part of the final package. Rather, the "leads" of the present invention are the squashed ball bonds formed by the wire bonding and reflow processes. Kitahara does not use any wire bonding processes, nor form any ball bonds.

Furthermore, the copper sheet of Kitahara cannot be properly combined with the process taught by Igarashi because Kitahara is a lead frame type process, so attaching the wires (20) of Igarashi to the leads (3) of Kitahara would not form the ball bonds that act as terminals of the present invention.

More particularly, if the lead frame of Kitahara were substituted for the substrate (11, 13, 14) of Igarashi, one would have the wires extending from the IC bond pads to the leads of the Kitahara lead frame, and then solder balls

would have to be attached to the bottom of the leads to form the terminals. Note that the lead frame would not be removable in the same manner that the sheet is removed in the present invention. Thus, the Kitahara lead frame is not removable and would require the attachment of solder balls to form contacts akin to the terminals of the present invention. As the present invention does not include such steps, the method of the present invention differs from a method taught by a combination of Igarashi and Kitahara.

As discussed above and defined in independent claims 1, 15 and 18, the present invention uses a foil sheet with a single layer of solder. The package terminals are formed by ball bonding to the solder layer, performing a reflow, and then removing the foil sheet. There is neither a lead frame nor a multi-layer substrate used in the process. The present invention is therefore very different from the processes taught by Igarashi and Kitahara, either alone or in combination. Accordingly, Applicants respectfully request that the rejection under section 103 be withdrawn.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application, including claims 1-6 and 8-20, is in condition for allowance and such action is respectfully requested.

Respectfully submitted,

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(Date)

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